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CHRYSOMELIDAE OF KANSAS (1)

By J. R. DOUGLASS, Estancia, New Mexico.

This paper is submitted as a result of one year's study on the species of Chrysomelidae found occurring in Kansas. The purpose of this study is to bring together into one paper all of the species of Chrysomelidae, their distribution, and as much information on their habits as possible. A few of these species are very rare and are known only from occasional records of the past sixty-four years.

The first paper dealing with the Coleoptera of Kansas was by LeConte (1859). This has been followed from time to time by many papers; the last one published was in 1917 by Knaus. Since the publication of these papers a few generic as well as a number of specific names have changed and it is, therefore, advisable to bring all names up to date to agree with those used by Leng (1920) in his Catalogue, whose arrangement and numbering has been followed.

Source of Data

The Chrysomelidae in the following collections have been studied by the writer; the Kansas State Agricultural College Collection; the Knaus Collection at McPherson; and the Snow Collection at the University of Kansas. The data found on the labeled specimens from Kansas in these collections have been used. The accessioned notes on the specimens in the Kansas State Agricultural College Collection have been studied and the data found are given herein. Many of the determinations were made by workers in the College, among them being Popenoe, Dean, Marlatt, Norton, and others. All determinations have been verified by the writer and compared with specimens in Snow's Collection and in the Knaus' Collection. The literature dealing with Kansas Coleoptera has been reviewed as well as that pertaining to the family, different subfamilies and tribes in the United States.

(1) Contribution No. 363 from the Department of Entomology, Kansas State Agricultural College. Also presented to the Faculty of the Graduate School of Kansas State Agricultural College, May 1923, as a thesis in partial fulfillment of the requirements for the degree of master of science.

Chrysomelidae is one of the largest and most beautiful families of Coleoptera, being world wide in distribution. Leng (1920) lists 152 genera, 974 species and 117 varieties in America north of Mexico; of which number 94 genera, 315 species and 39 varieties occur in Kansas.

The arrangement of the accompanying list is as follows: (1) Leng (1920) catalogue number: (2) Species name; (3) reference to literature in parentheses, the papers of each authority being numbered, as (Popenoe 1); (4) distribution; (5) dates collected; and (6) notes.

Acknowledgement

Grateful acknowledgement is made to all of the members of the staff of the Department of Entomology at the Kansas State Agricultural College; especially to Dr. R. C. Smith under whose direction the work was done and whose kindly criticisms and suggestions have been most appreciated; to Prof. S. J. Hunter of the Department of Entomology at the University of Kansas for permission to study and compare specimens with those in the Snow Collection; to Mr. Warren Knaus for the privilege of looking through his collection, for verifying and correcting determinations and for the determination of some species; and to Dr. E. A. Schwarz of the United States Bureau of Entomology for the determination of several specimens.

Subfamily DONACIINAE

Haemonia Latr.

15193 **H. nigricornis** Kby. (Popenoe 1). Douglas County.

Donacia Fab.

15200 **D. hypoleuca** Lac. Douglas County.
15202 **D. piscatrix** Lac. (Popenoe 2). Douglas and Riley Cos..
15203 **D. subtilis** Kunze. (Popenoe 1). Douglas Co.
15209 **D. aequalis** Say. (Knaus 9). Jefferson and Shawnee Cos.
15211 **D. distincta** Lec. (Knaus 4). Pottawatomie and Riley Cos.
15213 **D. pusilla** Say. (Snow 2). Douglas Co.
15217 **D. flavipes** Kby. (Leng 1). Kansas.

Subfamily ORSODACNINAE

Orsodacne Latr.

15219 **O. atra** (Ahr.). (Popenoe 2). Douglas and Shawnee Cos.

15219b **O. atra** var. **hepatica** Say. Sandhills Riley Co. August.

15219f **O. atra** var. **vittata** Say. (Popenoe 2). Douglas Riley, Shawnee, and Wallace Counties.

Zeugophora Kunze.

15229 **Z. scutellaris** Suffr. (Popenoe 1). Kiowa and Shawnee Cos.

15233 **Z. varians** Cr. (Crotch, Horn 4, Knaus 7). Kansas.

Subfamily CRIOCERINAE

Lema Fab.

15236 **L. cornuta** Fab. (Knaus 4). Reno and Riley Cos.

15238 **L. texana** Cr. (Snow 4, Knaus 6). Clark Co.

15243 **L. collaris** Say. (Popenoe 1, Snow 1). Cowley, Douglas, Shawnee, Wallace, Wilson, and Riley Counties.

15248 **L. circumvittata** Clark. (Knaus 1). Saline Co.

15253 **L. trilineata** (Oliv.). (Popenoe 1, Snow 1). Douglas, Gove, Reno, Rice, and Riley Cos. Collected from May to September on alfalfa, clover, salvia, solidago, sorghum and sunflowers: common on **Physalis** spp.; more rerely found on Irish potatoes.

15255 **L. nigrovittata** Guer. (Snow 4, Knaus 6). Clark Co.

Subfamily CLYTRINAE

Antipus De G.

15262 **A. laticlavia** (Forst.). (Popenoe 1). Douglas, Comanche, Riley, Shawnee and Wilson Counties. July. Commonly found on **Vernonia** sp.

Megalostomis Lac.

155266 **M. subfasciata** (Lec.). (Horn 4, Knaus 7). Kansas.

Coscinoptera Lac.

15267 **C. dominicana** (Fab.). (Popenoe 1). Douglas Geary, Johnson, McPherson, Pottawatomie, Riley, Wabaunsee, and Wilson Counties. May-

July. Abundant on **Rhus glabra.**

15269 **C. vittigera** Lec. (Crotch).

15270 **C. axillaris** Lec. (Popenoe 1, Snow 1). Clark, Geary, Douglas, Finney, Gove, Kiowa, Pratt, Hamilton, Rawlins, Riley, Rooks and Wallace Counties. May to August on horse thistle and wild daisies.

15273 **C. mucorea** Lec. (Knaus 1). Saline Co.

15275 **C. aeneipennis** Lec. (Knaus 6). Clark and Hamilton Cos.

Babia Lac.

15282 **B. quadriguttata** (Oliv.). (Popenoe 1). Douglas, Ellis, Neosho, Pottawatomie, Riley and Wilson Counties. July and August, on prickly ash and sumac.

Saxinis Lac.

15287 **S. saucia** Lec. (Popenoe 1).

15292 **S. omogera** Lac. (Snow 4). Clark, Douglas, Ellsworth, Gove, Hamilton, Reno, and Riley Counties. May-July.

15294 **S. knausi** Schffr. (Knaus 8). Clark and Kiowa Counties.

Subfamily CHLAMYDINAE

Chlamys Knoch

15297 **C. gibbosa** (Fab.). (Knaus 8). Douglas, Reno, and Riley Cos.

15300 **C. foveolata** Knoch. (Popenoe 1). Riley Co.

Exema Lac.

15305 **E. gibber** (Oliv.). (Knaus 4). Pottawatomie County.

15306 **E. conspersa** (Mann.). (Popenoe 2). Douglas, Riley, Shawnee and Wilson Counties.

Subfamily CRYPTOCEPHALINAE

Griburius Hald.

15308 **G. scutellaris** (Fab.). (Popenoe 1). Eastern Kansas.

15310 **G. montezuma** (Suffr.). Kiowa County. Taken July 6, 1923 in a buzzard roost, near Belvidere. Specimens found resting on the rocky roof and sides of the cave used as a roost and nesting place by the buzzards. R. H. Beamer of the Department of Entomology of the State Univer-

sity at Lawrence took the pupae of this species from this cave, April 1924 and later **G. montezuma** emerged The larvae evidently feed on the buzzard feces.

—**G. montezuma** (Suffr.). var. undescribed. Elytra entirely black. Ellsworth, Saline and Riley Counties.

Pachybrachys Redt.

15336 **P. arizonensis** Bowd. (Fall, Knaus 11, 13). Douglas Co.

15339 **P. livens** Lec. (Snow 4, Popenoe 1). Clark, Douglas, Hamilton, and Morton Counties.

15341 **P. parvinotatus** Fall. (Fall, Knaus 13). Clark, Douglas, Hamilton and Meade Counties.

15348 **P. abdominalis** (Say). (Fall, Knaus 11, 13). Barton, Clark, Hamilton, McPherson, Morton, Pratt, Reno, Riley, Saline, and Stevens Counties.

15349. **P. diversus** Fall. (Knaus 13, Fall). Clark, Douglas, Kingman, Kiowa, Rawlins, Reno, Riley and Saline Cos.

15358 **P. sobrinus** (Hald.). (Popenoe 1, Snow 4, Fall, Knaus 13). Bourbon, Clark, Douglas, Linn, Reno, Riley, Saline, Shawnee, and Wallace Counties.

15371 **P. subfasciatus** Lec. Reno Co.

15372 **P. impurus** Suffr. (Fall, Knaus 13). Pottawatomie Co.

15372b **P. impurus** var. **umbrosus** Fall. (Knaus 13). Reno and Saline Counties.

15378 **P. turbidus** Lec. (Fall, Snow 2). Douglas, Ellis, Linn, Miami, Pottawatomie, Riley, Saline, and Shawnee Cos.

15384 **P. calcaratus** Fall. (Fall, Knaus 13). Saline Co.

15388 **P. caelatus** Lec. (Fall, Snow 4). Greeley, Hamilton and Saline Counties.

15393 **P. peccans** Suffr. (Fall, Knaus 13). Reno, Sedgwick and Douglas Counties.

15396 **P. postfasciatus** Fall. (Fall, Knaus 13). Douglas Co.

15407 **P. atomarius** (Melsh.). (Knaus 11, Popenoe 1). Crawford, Douglas, Linn, McPherson, Miami and Riley Counties.

15408 **P. vestigialis** Fall. (Fall, Knaus 13). Douglas and Reno Counties.

15413 **P. roboris** Fall. (Fall, Knaus 13). Douglas, Reno and Saline Counties.

15432 **P. tridens** (Melsh.). (Le Conte 4, Fall, Knaus

13, Popenoe 1). Douglas Co.

15433 **P. obsoletus** Suffr. (Fall, Knaus 13). Douglas, Finney, Rawlins, Saline, Reno and Sheridan Counties.

15439 **P. liebecki** Fall. (Fall, Knaus 13). Clark, Hamilton, and Reno Counties.

15440 **P. bivittatus** (Say). (Fall, Knaus 13). Douglas, Hamilton, Meade, McPherson, Pawnee, Reno, Riley, Rooks, Trego, Wallace and Wilson Counties. May-July.

15444 **P. litigiosus** Suffr. (Popenoe 1). Bourbon, Cowley, Clark, Ellis, Gove, Hamilton, Linn, Miami, Morton, Riley and Wallace Counties.

15445 **P. virgatus** Lec. (LeConte 4, Snow 4, Fall, Knaus 13). Clark, Douglas, Hamilton ,Saline and Reno Counties.

15446 **P. dubiosus** Lec. (Fall, Knaus 10,13). Clark, Marion, Morton, Norton, Pottawatomie, Sedgwick, and Wallace Counties.

15447 **P. pawnee** Fall. (Fall, Knaus 13). Bourbon, Crawford, Douglas, Pottawatomie, Reno, Saline, and Wallace Counties.

15448 **P. vau** Fall. Barber, Bourbon, Douglas, Linn, Meade, Miami and Wallace Counties.

15448a **P. vau** var. **imperfectus** Fall. Meade Co.

15450 **P. pallidipennis** Suffr. (Knaus 14, LeConte 4). Bourbon, Douglas and Riley Counties.

15451 **P. othonus** (Say). (Fall, Popenoe 1). Bourbon, Douglas, Linn, Miami, Reno, Riley and Shawnee Counties.

15453 **P. autolycus** Fall. (Fall, Knaus 13). Clark, Douglas, Hamilton, McPherson, Meade, Pottawatomie, Reno, Sedgwick, and Wallace Counties.

15454 **P. nigricornis** (Say). (Fall, Knaus 13). Southern Kansas.

15455 **P. carbonarius** Hald. (Fall, Knaus 13, Popenoe 1, Snow 4). Douglas, Hamilton, Pottawatomie, Shawnee and Wilson Counties.

15457 **P. viduatus** (Fab.). (Popenoe 1, Snow 1, 4). Clark, Gove and Hamilton Counties.

15458 **P. m-nigrum** (Melsh.). (Fall, Knaus 13). Kansas.

15459 **P. trinotatus** (Melsh.). (Fall, Knaus 13). Douglas County.

15462 **P. luridus** (Fab.). (Fall, Knaus 1, Popenoe 1). Douglas, Pottawatomie, Riley and Saline Counties. May-August.

15462a **P. luridus** var. **nigrinus** Blatch. Medora sandhills.

15462b **P. luridus** var. **festivus** Fall. (Fall, Knaus 13). Medora sandhills.

15464 **P. falli** Leng. (Fall, Knaus 13). Kansas.

15470 **P. hepaticus** (Melsh.). (Fall, Knaus 13, Popenoe 2). Douglas, Gove, Hodgeman, Kiowa, Reno, Riley, Saline and Shawnee Counties.

Monachulus Leng.

15472 **M. ater** (Hald.). (Knaus 1). Salina.

15473 **M. saponatus** (Fab.). (Popenoe 1). Douglas, Riley, Rooks and Shawnee Counties. June-July.

Cryptocephalus Goeffr.

15477. **C. basalis** Suffr. (LeConte 4, Popenoe 1, Snow 4). Chautauqua, Clark, Douglas, Ellis, Miami, Pottawatomie and Riley Counties. May-July. Collected on sumac (**Rhus glabra**) and sorghum.

15479 **C. notatus** Fab. (Popenoe 1). Clark, Douglas, Reno, Riley and Russell Counties. June-July.

15480 **C. quadruplex** Newn. (Popenoe 1). Douglas, McPherson, Pottawatomie, Riley and Reno Counties. May-July. Abundant on **Rhus glabra**.

15483 **C. guttulatus** Oliv. (Knaus 2). Riley, Saline, Shawnee, and Wilson Counties. July-September. On honey locust.

15487 **C. leucomelas** Suffr. (LeConte 4, Popenoe 1). Clark, Douglas, Logan, Pawnee and Riley Counties. May-September.

15493 **C. confluens** Say. (LeConte 4, Popenoe 1, Snow 1, 2). Clark, Morton, Pottawatomie and Wallace Counties.

15495 **C. venustus** Fab. (LeConte 4, Popenoe 1, 2). Bourbon, Cowley, Crawford, Douglas, Kiowa, Labette, Linn, Miami, Montgomery, Pottawatomie, Riley and Shawnee Counties. June-August.

15495a **C. venustus** var. **cinctipennis** Rand. (Knaus 4). Douglas, Linn, Pottawatomie, Riley and Wabaunsee Counties. June-July.

15495b **C. venustus** var. **hamatus** Melsh. Douglas Co.

15495c **C. venustus** var. **ornatulus** Clav. (Popenoe 1). Eastern Kansas. Douglas Co.

15495d **C. venustus** var. **simplex** Hald. Douglas Co.

15498 **C. carinatus** Lec. (LeConte 4, Knaus 1).

Bourbon, Crawford, Franklin, Linn, Miami, Montgomery, Pottawatomie, Riley, and Saline Counties.

15507 **C. mutabilis** Melsh. (LeConte 4). Douglas, Bourbon, Kiowa, Miami, Osborne, Pawnee, Pottawatomie and Riley Counties. Collected during July on peanuts.

15509 **C. fulguratus** Lec. (Knaus 1). Salina.

Diachus Lec.

15521 **D. auratus** (Fab.). (Knaus 6). Kingman and Kiowa Counties.

15527 **D. catarius** (Suffr.). (Popenoe 2). Riley and Shawnee Cos.

15528 **D. pallidicornis** (Suffr.). (Knaus 6, LeConte 4, Snow 2). Northeast Kansas, Douglas and Rooks Counties.

15529 **D. chlorizans** (Suffr.). (Knaus 1, Popenoe 2). Douglas and Saline Counties.

Bassareus Hald.

15530 **B. brunnipes** (Oliv.). (Popenoe 1, Snow 4). Clark, Douglas, Gove, Neosho and Riley Counties. June-July on weeds.

15532 **B. formosus** (Melsh.). (Knaus 4). Pottawatomie and Saline Counties.

15533 **B. detritus** (Oliv.). (Knaus 8). Kansas.

15534 **B. mammifer** (Newn.). (Knaus 4). Pottawatomie and Shawnee Counties.

15534b **B. mammifer** var. **luteipennis** (Melsh.). (Knaus 4). Pottawatomie Co.

15534d **B. mammifer** var. **sellatus** Suffr. (Popenoe 2). Douglas and Riley Counties.

15536 **B. lituratus** (Fab.). (Popenoe 2). Reno and Saline Cos.

15536b **B. lituratus** var. **lativittis** (Germ.). (Popenoe 2). Douglas, Reno, Riley and Shawnee Counties. May- July.

15536d **B. lituratus** var. **recurvus** Say. Douglas. Pottawatomie, and Saline Counties.

Triachus Lec.

15539 **T. vacuus** Lec. (LeConte 4, Snow 2). Douglas, Saline and Shawnee Counties.

Subfamily EUMOLPINAE

Chrysodina Baly.

15544 **C. globosa** (Oliv.). (Popenoe 2, Snow 1, 4). Clark, Gove, Hamilton and Norton Counties.

Nodonota Lef.

15545 **N. tristis** (Oliv.). (Horn 5, Popenoe 1, Snow 2, 4). Clark, Douglas, Gove, Riley, Shawnee and Wabaunsee Counties. July-August.

15547 **N. convexa** (Say). (Popenoe 1). Cheyenne, Gove, Pottawatomie, Shawnee and Trego Counties.

15549 **N. puncticollis** (Say). (Horn 1, Popenoe 1). Douglas, Pottawatomie and Riley Counties. May-June. On wild rose.

Metaparia Cr.

15551 **M. clytroides** Cr. (Popenoe 1). Douglas, Kiowa, Mitchell and Russell Counties. June on **Petalostemum sp.**

Colaspis Fab.

15555 **C. brunnea** (Fab.). (Popenoe 1, Snow 4). Clark, Douglas, Gove, Graham, Reno, Riley, Shawnee and Trego Counties. July on weeds.

15555a **C. brunnea** var. **costipennis** Cr. Douglas, Marion, Pottawatomie and Riley Counties. July-August.

15555b **C. brunnea** var. **flavida** Say. (Popenoe 1, 2, Snow 1). Douglas, Gove, Riley and Wallace Counties. July-September. Collected on corn, grape, peanuts and **Solidago.**

15559 **C. favosa** Say. (Horn 5, Popenoe 1, Snow 1). Bourbon, Comanche, Douglas, Gove, Gray, Pottawatomie, Riley, Shawnee, Clay and Wallace Counties. June-July. Collected on apple leaves, which were eaten full of holes. Common at Clay Center on **Psoralea argophylla.**

Rhabdopterus Lef.

15563 **R. picipes** (Oliv.). (Popenoe 1, 2). Douglas, Gove, Johnson, Riley and Shawnee Counties. June-July. On plum trees.

Graphops Lec.

15564 **G. beryllinus** Lec. (Horn 5, Knaus 7). Kansas.

15566 **G. varians** Lec. (Horn 5, Knaus 4, Snow 4). Clark and Kiowa Counties.

15567 **G. pubescens** (Melsh.). (Popenoe 1). Douglas, Pottawatomie, Riley and Shawnee Counties. June-August. In flowers of **Oenothera biennis.**

15568 **G. curtipennis** (Melsh.). (Popenoe 1). Douglas, Riley, and Shawnee Counties. May-June. On oats and wheat.

15569 **G. marcassitus** Cr. (Popenoe 1). Douglas, Reno and Riley Counties. July.

15570 **G. nebulosus** (Lec.). (Crotch, Horn 5, Popenoe 1, 2). Douglas, Riley, Rooks, Shawnee and Trego Counties. August. On **Gaura** and **Oenothera.**

15571 **G. bicolor** Lef. (Knaus 12). Cheyenne, Riley and Shawnee Counties.

Xanthonia Baly.

15573 **X. decemnotata** (Say). (Popenoe 1). Douglas, Pottawatomie and Riley Counties. June.

15574 **X. villosula** (Melsh.). (Knaus 1, Popenoe 1). Douglas, Riley, Shawnee and Wilson Counties. June. Commonly swept from oak leaves.

Fidia Baly.

15577 **F. viticida** Walsh. (Knaus 4, Popenoe 1). Douglas, Pottawatomie and Riley Counties. July.

15578 **F. longipes** (Melsh.). (Popenoe 1). Douglas and Riley Cos. June-August. On grape leaves and beans.

Metachroma Lec.

15580 **M. aeneicollis** Horn. (Knaus 6, Snow 4). Clark and Reno Counties.

15581 **M. longulum** Horn. Pottawatomie Co.

15582 **M. dubiosum** (Say). (Horn 5, Knaus 1, Snow 4). Clark, Finney and Morton Counties.

15590 **M. interuptum** (Say). (Crotch, Horn 5, Popenoe 1). Kiowa and Rooks Counties.

15591 **M. angustulum** Cr. (Crotch, Horn 5, Knaus 4, Snow 4). Clark and Reno Counties. May-June. On willow.

15592 **M. parallelum** Horn. (Knaus 4, Snow 4). Clark and Reno Counties. May-June. On willow.

15593 **M. laevicollis** Cr. (Knaus 4). Pottawatomie Co.

15595 **M. marginalis** Cr. (Crotch, Horn 5). Kansas.

15598 **M. pallidum** (Say). (Popenoe 1). Eastern Kansas, Clark Co.

15598a **M. pallidum** var. **lateralis** Cr. (Crotch, Horn 5).

Kansas.

15601 **M. quercatum** (Fab.). Marion Co.

Myochrous Er.

15608 **M. denticollis** (Say). (Popenoe 1). Butler, Douglas, McPherson, Riley, Sumner, Shawnee, Wabaunsee and Reno Counties. April-June. A pest of corn in Kansas. Collected in February hibernating under leaves.

15611 **M. squamosus** Lec. (Crotch, Horn, Popenoe 1, Snow 1, 4). Clark, Gove and Riley Counties. June.

Glyptoscelis Lec.

15620 **G. cryptica** (Say). (Horn 5, Popenoe 1). Douglas and Riley Counties. Collected in June mating on cottonwood.

Colaspoidea Lap.

15621 **C. cuprascens** (Lec.). (Knaus 4). Medora sandhills.

Typophorus Er.

15625 **T. viridicyaneus** (Cr.). (Popenoe 1). Douglas, Miami, Riley, Sumner, and Shawnee Counties. July. Common on **Ipomoea pandurata** and also found on sweet potato vines.

Paria Lec.

15626 **P. canella** (Fab.). Douglas and Hamilton Counties.

15626a **P. canella** var. **aterrima** (Oliv.). (Knaus 1, Popenoe 1, 2). Douglas, Pottawatomie, Republic, Riley, Saline and Shawnee Counties. June-July. Swept from meadow and marsh vegetation.

15626c **P. canella** var. **pumila** Lec. (Crotch, LeConte, Snow 4). Hamilton Co.

15626d **P. canella** var. **quadriguttata** Lec. Douglas, Pottawatomie, and Riley Counties. Found hibernating in rubbish during March.

15626e **P. canella** var. **quadrinotata** (Say). (Popenoe 1). Douglas and Riley Counties. May-August.

15626g **P. canella** var. **sexnotata** (Say). (Popenoe 1, Snow 1). Douglas, Gove, Riley and Hamilton Counties.

15626h **P. canella** var. **thoracica** (Melsh.). Riley Co.

June. On corn.

15626i **P. canella** var. **vittata** Horn. (Snow 4). Hamilton Co.

Chrysochus Redt.

15627 **C. auratus** (Fab.). (Popenoe 1). Clark, Douglas, Pottawatomie, Riley, Shawnee, Sumner and Wallace Counties. May-June. On corn and sorghum.

Colaspoides Lap.

15630 **C. opacicollis** Horn. (Knaus 6). Clark County.

Subfamily CHRYSOMELINAE

Prasocuris Latr.

15636 **P. vittata** (Oliv.). Western Kansas.

15637 **P. obliquata** Lec. (Popenoe 1). Gove Co.

Labidomera Chev.

15639 **L. clivicollis** (Kby.). Kansas.

15639a **L. clivicollis** var. **rogersi** Lec. (Linell 1, Popenoe 1). Douglas, McPherson, Norton, Riley and Saline Counties. July-September. On milkweed and wild morning glory.

Leptinotarsa Stal.

15648 **L. decemlineata** (Say). (Popenoe 1, Snow 4). Statewide. Clark, Douglas, Gove, Hamilton, Logan, Meade, Norton, Riley, Russell and Stafford Counties. March-September. On potato, eggplant and **Solanum rostratum.**

Zygogramma Chev.

15652 **Z. exclamationis** (Fab.). (Popenoe 1, Rogers, Snow 1). Chautauqua, Clark, Cowley, Douglas, Ellis, Gove, Hamilton, Hodgeman, Lane, Logan, Meade, Morton, Neosho, Riley, Russell, Seward and Wallace Counties. May-August. Found on **Helianthus lenticularis** and **H. petiolaris.**

15653 **Z. conjuncta** Rogers. (Linnell 1, Rogers). Clark, Hamilton, Rush, Seward and Wallace Counties. Collected in August on weeds.

15653a **Z. conjuncta** var. **pallida** Bland. (Knaus 6, Linell 1, Popenoe 2, Snow 4). Clark, Finney, Hamilton, Kearney, Morton, Norton, and Wallace Counties. June-September.

15655 **Z. suturalis** (Fab.). (Popenoe 2). Douglas, Ellis, Riley, Reno, and Trego Counties. Collected in July and August on weeds.

15655a **Z. suturalis** var. **casta** Rogers. (Rogers). Kansas.

15656 **Z. disrupta** Rogers. (Linnell 4, Popenoe 2, Rogers, Snow 4). Barber, Clark, Comanche, Cowley, Douglas, Ellis, Gove, Graham, Hamilton, Kearney, Kiowa, Norton, Reno, Riley, Rooks, Seward, Stafford, Stevens and Wallace Counties. May-September. On willow and weeds.

15657 **Z. heterothecae** Linell. (Knaus 4). Clark, Harper, Kiowa, Reno and Rooks Counties. June-August.

Calligrapha Er.

15665 **C. similis** Rogers. (Popenoe 1). Cherokee, Douglas, Labette, Linn and Riley Counties. July-August.

15666 **C. incisa** Rogers. (Linell 1, Rogers). Kansas.

15668 **C. praecelsis** Rogers. (Linell 1, Rogers). Douglas, Labette, Pottawatomie and Riley Counties. June.

15669 **C. elegans** (Oliv.). (Knaus 4). Pottawatomie County.

15671 **C. scalaris** Lec. (Snow 4). Clark, Douglas, Meade, Pottawatomie and Riley Counties. April-September. On elm, hazelnut, and willow. Found hibernating under bark in October.

15674a **C. philadelphica** var. **spireae** (Say). (Knaus 1, Popenoe 1). Riley and Shawnee Counties.

15676 **C. multipunctata** (Say). (Popenoe 1, Snow 1). Douglas, Gove, Riley, Shawnee and Wallace Counties. July.

15682 **C. multiguttata** Stal. (Linell 1, Popenoe 1). Kansas.

Chrysomela L.

15686 **C. flavomarginata** Say. (Linell 1, Rogers). Kansas.

15688 **C. auripennis** Say. (Popenoe 2, Snow 4). Clark, Douglas, Ellis, Ford, Kiowa, McPherson, Meade, Reno and Riley Counties. May-October.

15692 **C. subopaca** Rogers. Marion Co.

Phaedon Latr.

15698 **P. oviformis** (Lec.). (Popenoe 2). Douglas and Gove Cos.

15699 **P. viridis** (Melsh.). (Popenoe 1). Riley and Shawnee Cos. May.

Gastroidea Hope

15701 **G. polygoni** (L.). (Popenoe 1). Douglas, Riley and Shawnee Counties. July-September. Found hibernating in rubbish during March.

15702 **G. dissimilis** (Say). (Popenoe 1). Douglas, Gove, Pottawatomie, Riley and Wabaunsee Counties. March-April. Swept from wheat and oats.

15703 **G. cyanea** Melsh. (Popenoe 1). Allen, Douglas, Geary, Pottawatomie, Riley and Wabaunsee Counties. April-June. On dock and sumac. Often very abundant on **Rumex britannica.**

15704 **G. viridula** (DeG.). (Popenoe 2, Rogers). Kansas, Medora sandhills. May.

Lina Redt.

15708 **L. lapponica** (L.). (Popenoe 1, Snow 1, 4). Clark, Douglas, Gove, Montgomery, Reno, Riley, Shawnee and Wyandotte Counties. April-June. On willow and apple. Attracted to light.

15710 **L. scripta** (Fab.). (Popenoe 1, Snow 4). Douglas, Gove, Hamilton, Kiowa, Riley and Saline Counties. April-July. On apple, cottonwood, **Salix amygdaloides,** wheat heads and willow.

Phyllodecta Kby.

15717 **P. vulgatissima** (L.). (Knaus 8). Central Kansas.

(To be Continued.)

A METHOD FOR REARING WIREWORMS (Elateridae)*

By

HARRY R. BRYSON, Kansas Agricultural Experiment Station

The problem of rearing wireworms successfully has been a very difficult one for investigators interested in ecological studies of subterranean insects. Since these

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insects spend a greater part of their life cycles in the soil, it is a laborious task to observe their responses to changes in food, temperature, soil moisture, and other factors which modify their environment and in turn affect the lengths of their life cycles.

When wireworm larvae are collected and confined where they have no opportunity to select their environmental conditions, the mortality, no doubt, is greatly increased over that occurring in nature. It is difficult to determine whether the new environment will increase, decrease, or have no effect upon the lengths of the life cycles of the larvae that survive. Hence, it is almost impossible to ascertain how accurately the results of such rearings check with the length of time required to complete the cycles under natural conditions. It would be desirable, therefore, to employ a method of rearing which would approximate natural conditions.

The writer has had excellent results with a method which apparently approaches very closely natural conditions, and which should prove a valuable aid in solving many of the wireworm rearing problems.

Review of Literature

Lane (1924) had very good results rearing wireworms in galvanized cylinders. Davis (1915) found that large flower pots could be used successfully in rearing white grubs. Graf (1914) tried several types of rearing cages for wireworms and found large flower pots to be the most satisfactory. Hyslop (1915) used a root cage in rearing wireworms, made by sinking a molasses barrel to the level of the surface of the earth. The barrel was filled with earth and the top closed with a short cylinder of sheet iron covered with gauze. McColloch (1917) described a method for rearing subterranean insects. This method proved more successful in white grub studies than in the case of rearing wireworms.

Methods

The method which had been used for rearing wireworms at this station prior to 1928 was the salve box method. Larvae collected from the field were placed into individual one-ounce salve boxes filled with sifted soil which contained enough moisture to insure the germination of the three grains of wheat placed therein to furnish food for the larvae. These boxes were then numbered to coincide with a serial number on the record

sheet.

The moisture content of the soil and the food supply were maintained by changing the soil and replenishing the food every week or ten days throughout the summer. The soil alone was changed at monthly intervals during the winter when the larvae were inactive. These boxes were then placed into a rearing cave, described by McColloch (1917).

The foregoing method was supplanted by the tile method during 1928, with much better results. Ordinary unglazed drain tiles, six inches in diameter and one foot in length, were used. In setting each tile, a hole was dug 22 inches deep. A smooth, flat rock was used in the bottom of the hole to furnish a base for the lower tile to prevent the escape of the larvae. Two of the tiles were matched together so as to leave no opening through which the larvae might escape. The bottom tile was placed on the rock and the dirt tamped solidly around it to hold it in position. The second tile was then placed on top of the lower one and the soil was tamped solidly around the column until level with the surrounding ground.

The remainder of the soil taken from the hole was sifted, examined for the presence of insects, and then tamped lightly into the cylinder, filling it to the top. After the soil within the cylinder had settled, it approached the level of the soil surrounding the tile. Wheat and oats planted thickly in each tile furnished an abundance of roots and sprouting grain for the larvae. A cone-shaped screen wire top, six inches high, was constructed in such a manner that it fitted snugly over the outside of the tile, and was held in place by means of a wire hoop.

It was necessary to replant the grain from time to time as the larvae killed the previous planting. During the summer, when the plants grew too rank, the screen wire cone was removed and the growth trimmed back. The soil in the tiles was not watered or treated differently from the surrounding soil, except as required to insure the germination of the cereals planted for food.

Twenty-five larvae were placed in each tile cage in the spring of 1928. Those placed in any one cage were collected at the same time, in the same locality, and habitat. Whenever possible the larvae were sorted so

that those in each tile cage were approximately the same size.

During the months of September and October, 1928, twenty one of the tile cages were dug up and carefully examined to determine the location of the insects at this time of the year. The top tile was removed, taken into the insectary, and placed in a horizontal position on the table. The soil was scraped out in one-fourth inch layers. This made it possible to determine the exact depth at which the insects could be found. The lower tile was removed and examined in much the same manner as the upper one.

After the lower tile was removed and examined it was an easy matter to clean out the hole and reset the empty tiles. All of the beetles found were mounted for identification purposes, while the remaining wireworms that had not pupated were grouped by habitats and placed in a single tile cage. This left the remaining cages free to be restocked. An attempt was made to keep the pupal and larval skins and mount them with the beetles. The number of insects found in each cage was recorded, as was the depth at which each was found.

Presentation of Data

In this study 21 tile cages, each containing 25 wireworms, or a total of 525 larvae, were under observation. One hundred ninety nine adult click beetles were recovered in their pual cells. One pupa, 24 larvae, and seven parasite cocoons were also found, making a total of 231 wireworms accounted for out of the original 525 larvae placed into the cages.

Hence, it will be seen that 38.9 percent of the wireworms collected in the field and placed in the tile cages emerged as dults the first year, while it was possible to account for 44 percent of the original number of larvae. No explanation relative to the fate of the remainder can be advanced at this time. It is interesting to note that only one adult emerged from 525 wireworms collected at the same time from the same locality confined in salve boxes and handled as described under "Methods" in this paper.

The following table shows that no beetles were taken closer than four inches to the surface, while 18 inches was the maximum depth at which they were

found. One hundred seventy nine, or 90 percent of the beetles were taken in their pupal cells at depth from 5 to 12 inches inclusive. The average depth for all of the beetles reared was 9.01 inches. This is a significant fact because one of the suggested methods for the control of wireworms is fall plowing in order to destroy the pupal cell. It is interesting to note that approximately 92 percent of the 199 adults were below the six-inch plow line.

The results of the findings are recorded in the following table:

TABLE SHOWING THE NUMBER OF INSECTS ACCOUNTED FOR AT VARIOUS DEPTHS

Depth	Adults	Larvae	Pupae	Parasite Cocoons*
4	4	0	0	
5	12	0	0	
6	32	0	0	
7	14	1	0	
8	26	1	0	
9	32	7	0	
10	21	4	1	
11	25	0	0	
12	17	5	0	
13	3	2	0	
14	3	1	0	
16	2	0	0	
17	0	0	0	
18	3	0	0	
19	0	0	0	
20	0	0	0	
21	0	0	0	
22	0	2	0	
Total	199	24	1	7

*No depth record kept.

The 24 wireworms recovered were found at depths varying from 7 to 22 inches, with an average of 10.6 inches. No record of depth was taken on the parasite cocoons found in the cages.

From the presentation of data, one can readily see that the use of the drain tile cage has proved unusually satisfactory for rearing wireworms and could be readily adapted to rearing other subterranean insects. The writer believes this method offers more nearly natural con-

ditions than any previously described. There are a number of other advantages that should be mentioned at this time.

(1) It is a very economical method, since the six-inch drain tiles can be purchased for about ten cents each. Very little time is required to set the tile cages and they are easily removed for examination. The larvae placed in them do not require frequent handling and feeding, as in the salve box method, and this decreases the mortality due to oversight and injury.

(2) The larvae have considerable freedom of movement vertically in the soil. They have an opportunity to select the desired moisture and temperature conditions. The moisture content of the soil within the 21 tile cages was apparently the same as that of the surrounding soil. Since the tiles are porous, the circulation of soil moisture and air is inhibited very little after they become moistened. The soil within the tiles, containing the wireworms, had numerous tunnels which suggest the possibility of studying burrowing methods and responses to changes in the soil moisture or temperatures.

(3) This method offers an opportunity for the investigator to study the feeding habits of the larvae. Various foods, baits and treated seeds could be tried under outdoor conditions because the wireworms would be in confinement where they could be observed more easily than in the field.

(4) Preliminary experiments indicate that this method will prove invaluable for rearing the wireworms from the egg to the adult stage. It will be difficult to get the moulting record of the young larvae, but this is a laborious task at best. It could be done by setting a single tile in the soil to be examined at frequent intervals.

(5) A larger number of larvae can be handled in the rearing work. This will facilitate the determination of the species that exist in a given locality, since a larger number will reach maturity. Since the larval and pupal skins can be obtained from the pupal cells, a study of the larval and pupal characteristics can be made in an effort to identify the different species.

The beetles that emerge from the tile cages are in splendid condition for taxonomic studies. There were only five beetles in the group of 199 individuals that

could not be mounted and used for study. Those which emerge from the salve boxes are usually distorted, abnormal in color, or with crumpled wings.

The writer believes that this method has a wide range of adaptability to many phases of soil insect rearing. Futher tests are necessary to test the lasting qualities of the tiles.

Summary

1. Investigators in the life history studies of subterranean insects have been in need of a successful method for rearing wireworms.

2. Thirty eight and nine-tenths percent of the wireworms collected and placed in cages made of six-inch, unglazed drain tiles, emerged as adult click beetles. while it was possible to account for 44 percent of the 525 larvae placed in the tiles.

3. Approximately 92 percent of the 199 beetles taken from their pupal cells were below the six-inch plow line, with an average depth of a fraction over nine inches.

4. The tile method is not only more economical but also offers a greater opportunity for observing the food habits and other activities under approximately natural conditions. Since large numbers can be handled, this method will no doubt prove invaluable for rearing the beetles from the egg stage to the adult, as well as insure a better condition of specimens to be used in taxonomic studies.

Literature Cited

Davis, J. J. 1915 — Cages and Methods of Studying Underground Insects. Jour. Econ. Entom., 8:135-139.

Graf, John E. 1914 — A Preliminary Report on the Sugar-beet Wireworm. U. S. Dept. Agri., Bu. of Entom., Bull. No. 123. p. 21-24.

Hyslop, J. A. 1915 — Wireworms Attacking Cereal and Forage Crops. U. S. Dept. Agri., Bull. No. 156, p. 14.

Lane, M. C. 1924 — Simple Methods of Rearing Wireworms (Elateridae). Jour. Econ. Entom., 17: 578-582.

McColloch, J. W. 1917 — A Method for the Study of Underground Insects. Jour. Econ. Entom. 10:183-188.

CORRECTIONS AND ADDITIONS TO THE COURSES IN ENTOMOLOGY OFFERED IN AMERICAN COLLEGES (1)

By

ROGER C. SMITH, Port-au-Prince, Haiti.

The following changes, largely involving the listing of entomological courses given in various institutions of the United States, have been indicated by members of staffs of the institutions concerned. In some cases this information has been voluntary; in other cases it has been given in answer to a request from the writer:

p. 14, No. 66. Massachusetts Agr. College course list should include graduate courses: 2. 23, 15 (2), 4, 3, 5, 35, 11, 14, 12, 13 (2), 25. 32, 6 (2), 16, 18, 8, 24 or 38, 37 (2), 36.

No. 71. Minnesota University, add courses in Apiculture and with some reclassification, courses should be listed as follows: 1 (4), 2, 5, 6 (2), 8 (3), 10, 12. 13 (2), 14, 16 (3), 17 (3). 19, 31, 32, 35, 36 (16), 39, 40, 43.

No. 81. Nebraska University. Change 13 (4) to 15 (4).

No. 83. New Hampshire University. Add graduate courses. The complete list should be as follows: 2 (4), 5, 7, 8. 9, 10, 13 (3), 14, 15, 19, 23 (2), 35, 36. 37.

p. 15, No. 117. South Dakota State College. Add three courses which were being given during 1926-27, but were not in the catalog: 7. 8, 36.

p. 16. Omit Wittenberg College listed as No. 145, p. 15. Substitute Iowa Wesleyan College, Mt. Pleasant, Iowa, offering courses: 1, 2, 4 in the department of Biology. The institution total remains at 153.

p. 19. Add 128 (Texas A. & M. College) to the group having a separate department of En-

(1) Smith, Roger C. The Courses in Entomology Offered in American Colleges. Kans. State Agri. College Bulletin. Vol. XII, No. 1, 23 pp., Jan. 1, 1928.

tomology, making the total 26 separate departments.

The writer suggests that the course records might have been listed better on the basis of exact titles alone and no attempt made to group them. A new course number would, therefore, have been given every variation of title. Course titles Nos. 15 and 17 have been criticized as being too broad. This point is added for the consideration of future workers with this or similar subject matter.

Judging by the relatively large number of letters received upon the distribution of this bulletin, there is need for futher and more detailed analyses of entomological instruction.

A NEW NAME FOR CICINDELA VIOLACEA FAB.

By W. KNAUS, McPherson, Kansas.

Some time ago, W. J. Brown of the Canadian National Collection of Coleoptera, Ottawa, Ontario, Canada, called my attention to the possibility that the variety of **Cicindela sexguttata** Fab., listed as **violacea** Fab. in the North American Collections was not in reality that variety, but was unnamed. Fabricius described the variety **violacea** in 1801, from specimens in the Bosc collection made in Carolina.

In March 1928, I wrote to Mr. Warren S. Fisher of the National Museum, Washington, D. C., who sent me a translation of Fabricius' description of **violacea** as follows:

violacea. Cyaneous, shining, with the labrum white. Habitat in Carolina. Collection of Mr. Bosc. Size medium. Entire body with elevted punctures, scabrous, cyaneous and shining. Antennae fuscous toward the tips. Labrum and mandibles at base above white.

Mr. Fisher said the National Collection contained specimens of **violacea** from Mississippi, Nebraska and Kansas. Mississippi examples, in the collection of John B. Smith had only state labels, and showed slightly green in color (not violet). These are probably the form **levettei** Casey, which is prevalent in the Mississippi Valley. The Kansas specimens were from Onago, and were collected by F. F. Crevecoeur, residing near

that town.

The description of **violacea** in 1801 could not apply to specimens in this part of the United States as it was not then United States territory and was inhabited by tribes of wild Indians only.

For this reason the specimens from this part of the United States cannot be **violacea,** and I propose the new name, **kansanus.**

Kansanus is of the same size and form as **C. sexguttata** Fab., but is of pure violet color, having no shade of green on either the dorsal or ventral surfaces. The labrum, and mandibles of the males at the base are white. The elytra are immaculate, except rarely a small white lateral median spot on each elytron, and a small dash of white on the elytral tips.

Two specimens in my collection are from near Onaga, Pottawatomie county, Kansas, collected by Crevecoeur who takes this variety in the bed of small dried up streams in July. Another specimen in my collection is from Bourbon county, Kansas, collected by R. H. Beamer of the State University at Lawrence.

The University of Nebraska at Lincoln has a specimen from West Point, Cuming county, South Bend, Cass county, from Lawrence, Nuckolls county and three from Omaha, Douglas county. Ralph O. Marts, of the Iowa State University, Iowa City, collected a specimen of **kansanus** near that city. This specimen has two small white spots on each elytron.

Dr. Walther Horn, of Berlin, Germany, says that the specimens taken near Onaga, constitute a well marked race of **sexguttata** Fab.

NOTES

Correction—In the article by Vera M. Fairbairn on "The Genus Hymetta", in Volume I, No. 4, of the **Journal,** the numbers of the plates should be reversed. Plate I on page 91 should be Plate II, and Plate II on page 92 should be Plate I.

Fifth Annual Meeting:—The fifth annual meeting of the Kansas Entomological Society will be held at Manhattan, Kansas, at the time of the annual meeting of the Kansas Academy of Science. The exact date for the Academy meeting has not been set, but it will probably be early in April.

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